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(54) **Surgical clip applier**

Einrichtung zum Anbringen chirurgischer Klammern  
Instrument pour poser des agrafes chirurgicales

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**US-A- 4 712 549** **US-A- 5 047 038**  
**US-A- 5 078 731**

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## Description

[0001] This invention relates to an instrument for applying a surgical clip in body tissue, and more particularly to an instrument for applying a surgical clip for anastomoses of a blood vessel.

[0002] The term "anastomosis" covers a variety of procedures in which blood vessels or other tubular members, such as parts of the colon, are joined or reconnected. Vessels may be joined in a variety of relative orientations, including end-to-end and end-to-side. Solid tubular structures such as peripheral nerves can also be joined together, as well as solid structures such as subcutaneous tissue and skin.

[0003] Anastomoses are performed by joining, clipping or suturing the vessels together at the juncture between them. When surgical clips are used, vascular anastomosis is achieved by approximating a pair of vessels, partially everting them and then joining the vessels by placing the arms of the surgical clip over the adjoining vessels. The arms of the surgical clip are then crimped about the tissue in such a way as to hold the vessel ends together without penetrating them.

[0004] Alternatives to conventional suturing process of joining vessels have been developed in order to prevent thrombosis which tends to occur at the points of penetration of the sutures. One such alternative, particularly for larger vessels, involves mechanical connectors such as collars. A second alternative to suturing is the use of surgical clips which are applied along the vessel juncture to perform a holding function similar to that of sutures, but without penetrating the vessel walls. Two such non-penetrating clips are shown in U.S. Pat. Nos. 4,586,503 and 4,733,664 to Kirsch et al. The former patent discloses a surgical microclip formed of plastically deformable metal or plastic material having minimal spring-back when crimped. The clip has a pair of parallel curved legs joined by a bridge at one end and terminating in rounded tips at the other end. The clip grips the edges of adjacent and everted tissue by crimping the legs together. The latter patent discloses a vascular surgical clip comprising a plastically deformable body portion, a tang for deforming the body, and a neck connecting the tang to the body, wherein the neck is designed to break upon application of a predetermined tensile force to the tang, and the body is designed to deform upon application to the tang of less than the predetermined tensile force.

[0005] As described in the above patents, the non-penetrating clips are applied over opposed edges of the vessels, the edges first being everted, or turned outward, to form flanges that are gripped between the jaws of the clips. Eversion not only enables the clip jaws to better grip the vessels, but also insures that only the interior surfaces of the vessels are in contact.

[0006] Vascular microsurgical clips are typically applied with a small hand-held tool that enables the surgeon to precisely place the clip over the tissue edges,

and then to close the clip, as by applying a squeezing pressure to the tool. One example of a prior art clip applicator for use in vascular microsurgery is disclosed in both U.S. Patent Nos. 4,733,664 and 4,929,240 to Kirsch et al. These patents disclose a tool for applying a surgical clip, the tool including means for gripping and applying tension to the tang of the clip while also having means for simultaneously pushing against shoulders on the clip body. The tool discloses in these patents requires that a clip be reloaded into the clip applicator after each clip is fired.

[0007] The need exists for an improved surgical clip and particularly for an instrument for applying such a surgical clip which can be utilised for vascular anastomosis. One specific need is for an instrument that can hold a plurality of clips and automatically feed and apply the clips individually to the vessel. It would also be desirable for the instrument to be simple to manufacture, easy to manipulate and which applies the clips with consistent accuracy so as to provide a secure joining of vessels and tissue. Since the instrument is intended to apply clips during vascular anastomosis it would be desirable to configure it similarly to other vascular surgical devices, i.e. tweezers or pincerlike implements, which are held between the thumb and forefinger of the user. One advantage of such a pincerlike implement is that it enables the user to activate the instrument near the working distal end, thereby providing improved tactility and stability.

[0008] US-A-5047038 discloses a hemostatic clip applicator which has an elongate shaft with a jaw assembly at one end and a housing at the other. A pair of finger ring handles protrude from the housing, one on each side. Squeezing the handles together crimps a clip from a magazine between the jaws of the device. Releasing the handles, so they return to their spread disposition effects an advance of the next clip from the magazine into a position between the jaws, ready for crimping.

## SUMMARY OF THE INVENTION

[0009] The present invention provides an instrument for applying a surgical clip to a blood vessel during a microsurgical anastomosis procedure. The clip applicator is designed for storage of multiple clips, and individual, automatic feed of the clips into the jaws of the instrument. Further, the applicator is designed to be similar in design to other instruments used during vascular surgical procedures, i.e. to be like a tweezer or other pincer like implement.

[0010] The invention provides a surgical clip applicator which is constructed with a pair of jaws for receiving and deforming a clip therebetween, a clip holding means having a series of clips for delivery to the jaws, a feed bar having a nose at a distal end and means for sequentially moving the feed bar from an initial distal-most position with the nose behind a clip positioned between the jaws to a proximal-most position behind a foremost clip

of the clip series. A pusher bar moves the series of clips distally.

**[0011]** The means for sequentially moving the feed bar is a pair of handles which are connected to the feed bar and which are movable between an open position corresponding to the distal-most position of the nose and a closed position corresponding to the proximal-most position of the nose.

**[0012]** The handles are oppositely and pivotally connected at the proximal end of the housing and are actuated at their distal ends, thereby improving the tactility and visibility of the working end of applicator, as well as the stability of the instrument. In addition, the jaws are part of a jaw blade assembly which is fixedly connected to the housing. A channel assembly is slidably mounted in the housing to envelope the jaw blade assembly with the feed bar slidably mounted in the channel assembly in overlying relation to the clip holding means. In operation, the applicator initially has a clip positioned between the jaws. Thus, a surgeon places the jaws of the applicator about a vessel and then squeezes the handles together. In response to closing of the handles the channel assembly is moved in a distal direction thereby closing the jaws to crimp the clip. At the same time, the feed bar is moved in a proximal direction to a position behind the foremost clip in the carrier. Once the handles are released, the feed bar moves in the distal direction to push the foremost clip to a position between the jaws. The applicator is then ready for application of the next clip.

**[0013]** A spring is provided in the housing for biasing the feed bar in a distal direction and for biasing the channel assembly in a proximal direction such that the handles are also biased into an opened position. A clip retainer is provided to prevent movement of the pusher bar which moves the stack of clips positioned on the clip holding means.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0014]** The present invention will be more fully appreciated as the same becomes better understood from the following detailed description of the present invention when considered in connection with the following drawings in which:

FIG. 1 illustrates a perspective view of the instrument of the present invention;

FIG. 2 illustrates an exploded perspective view of the instrument of the present invention;

FIG. 3 illustrates a top view of the handle of the present invention;

FIG. 4 shows a top view of the distal portion of the instrument of the present invention;

FIG. 5 shows a detailed top view of a unformed clip loaded in the jaws of the present invention;

FIG. 6 shows a detailed top view of a clip loaded in the jaws of the present invention;

FIG. 7 shows an enlarged top view of the jaw blade assembly of the present invention;

FIG. 8 shows an enlarged perspective view of the clip cover of the present invention;

FIG. 9 shows an enlarged perspective view of the jaw blade assembly and clip retainer of the present invention;

FIG. 10 shows an enlarged perspective view of the pusher bar of the present invention;

FIG. 11 shows an enlarged perspective view of the feed bar of the present invention;

FIG. 12 shows a side view of the distal end of the instrument illustrating a positioned but unformed clip in the jaws of the present invention;

FIG. 13 shows a side view of the distal end of the instrument illustrating the position of the clip retainer and feed bar after the clip has been formed in the jaws of the present invention;

FIG. 14 shows an enlarged detailed perspective view of the clip of the present invention; and

FIG. 15 shows an enlarged detailed top view of the clip of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

**[0015]** Referring to FIGS. 1 and 2, the surgical clip applicator 10 of the present invention includes a bottom housing 12, a top housing 14, a jaw blade assembly 17 having a pair of jaws, a channel assembly 16 slidably mounted in housings 12, 14, and a feed bar 18 slidably mounted in the channel assembly 16.

**[0016]** Referring to FIGS. 1 and 2, the bottom and top housings 12, 14 are secured together by pivot pin 24 and screws 34. The housings 12, 14 are of slender construction are made of any suitable material, for example, plastic material. As indicated, the inner surface 13 of the bottom housing 12 is contoured and recessed so as to receive various components of the applicator as further explained below. The inner surface 15 of top housing 14 is contoured for similar purposes. The pivot pin 24 extends through the proximal end of the housings 12, 14 and the proximal end of handles 22 to pivotally connect the handles 22 between the inner surfaces of the housings 12, 14 which are spaced apart to form a recess for receiving the handles 22. Spacers 11 are positioned in the housings 12, 14 to help form the recess between the housings 12, 14.

**[0017]** As shown in FIG. 1, the handles 22 are actuable at their distal ends 23; the end closest to the surgical site. This provides increased visibility, tactility and stability and enables the handles 22 to be held in a tweezer or pincer like manner.

**[0018]** Turning now to the jaw blade assembly 17 for forming the clip and with reference to FIGS. 2 and 9, jaw blade assembly 17 includes an elongated jaw blade 36 which has a pair of jaws 38 formed at a bifurcated distal end for receiving a surgical clip therein. Each jaw 38 is provided with a small slot or groove in a side wall so as

to receive therein a leg of the substantially C-shaped surgical clip 42 shown in FIGS. 14 and 15. Each jaw 38 also includes raised portions 39 which act as a stop for the clip cover 50 mounted thereon. The jaw blade 36 has a pair of camming surfaces 41 for engagement by channel assembly 16 to close the jaw in a manner described below.

[0019] The jaw blade assembly 17 also includes along its elongated portion a clip carrier portion 40 for holding a series of clips 42 (shown in detail in FIGS. 14 and 15). In this embodiment the clip carrier portion 40 is integral with the jaw blade assembly 17, although multiple elements could be used to achieve the same result.

[0020] The proximal, or rear, end of the jaw blade assembly 17 includes a plate 44 having a pair of oppositely positioned openings 46 for receiving the screws 34 which retain the jaw blade assembly 17 within the housings 12, 14. A tail 48 is formed in the proximal-most end of the jaw blade assembly 17 for providing additional support for the pusher bar 90.

[0021] A clip retainer 51 is mounted under the distal end of jaw blade assembly 17. As shown in FIGS. 2 and 9, the distal end of the clip retainer 51 has a pair of oppositely positioned side walls 52 and 54 and a raised distal end wall 56. The clip retainer 51 prevents movement in the distal direction of the stack of clips 42 and is movable from a position preventing movement of stack of clips 42, as shown in FIG. 12, to a position in which the stack of clips 42 advance distally, as shown in FIG. 13.

[0022] As shown in FIGS. 2 and 11, the feed bar 18 is elongated and has a depending nose 84 at its distal end. Nose 84 moves clip retainer 51 into its activated position by engagement of the walls 52, 54 and 56 when the feed bar 18 has moved behind the second clip 43 in the stack of clips 42, but the first clip 41 is still in the jaws 38 of the jaw assembly.

[0023] As indicated, the distal end of the feed bar 18 is angled slightly downwardly with the tip bent up. Feed cam bar 18 functions to feed individual clips to the jaws and is positioned within the rails 64 (see FIG. 8) of the clip cover 50. Feed bar 18 further includes a pair of triangular projections 86 which cam the feed bar 18 and stabilize its connection to the housings 12, 14 and a proximal abutment 88 for receiving spring 32 as mentioned above.

[0024] Clip cover 50, shown in FIGS. 2 and 8, is elongated and similar in shape to the jaw blade assembly 17 and functions as a tissue stop. The tissue stop 70 extends distally over the jaw blade 36. This tissue stop 70 has a bifurcated distal end which overlies and serves as a guide to prevent tissue from impeding movement of the clip 42 into the jaws 38. The cover 50 has a rounded cut out 53, a slot 60 and a pair of jaws 62 at its distal end. The pair of side walls or rails 66 provide a guide for the feed bar 18. The bottom surface 69 of the clip cover 50 is positioned atop jaw blade assembly 17 and includes a pair of downwardly extending side walls or

rails 67 between which the stack of clips 42 and the pusher bar 90 (see FIGS. 2 and 8) are provided.

[0025] Referring to FIGS. 1 and 2, the channel assembly 16, which as mentioned above functions to cam jaws 38 closed, includes an elongated channel shaped member 38 for enveloping the jaw blade assembly 17 and a pair of upstanding walls 72, a top wall 74 and a bottom wall 76. The top wall 74 and bottom wall 76 include a cutout 78 at their distal ends, and at the proximal end the top wall 74 includes recess 80 through which a projection 82 axially extends. The projection 82 engages an engagement member 83 of the forming cam 30 and thereby causes movement of the channel assembly 16 upon movement of the forming cam 30.

[0026] With reference to FIGS. 2 and 10, elongated pusher bar 90 has oppositely positioned projections 92 and a rounded member 94 extending from its distal end for engaging and pushing the last and most proximal clip 43 (see FIG. 4) on the clip carrier 40. The projections 92 engage the grooves 208 and the rounded member 94 engages the backspan 206 of the last clip 43. The proximal end of the pusher bar 90 includes a slot 96 for receiving a spring guide 98. A coil spring 102 fits within the molded contours of bottom housing 12. The channel 108 of spring 102 is engaged by the pin 110 which extends through an aperture 111 in the bottom housing 12. The feed spring 102 rolls along the top of the elongated portion 106 as the pusher bar advances the clips 42.

[0027] As shown in FIGS. 14 and 15, a surgical clip embodying the invention and designed for application by the clip applier 10 is formed of a unitary piece of biologically acceptable, plastically deformable material such as a noble metal (i.e. gold, silver, platinum, titanium etc.). While metal clips are presently preferred, it is contemplated that the other materials such as suitable polymer plastics may be used. The material, preferably titanium, is sufficiently ductile or plastically deformable so that when the clips crimped there is minimal spring-back. The clip is designed to apply contact force to the tissue regardless of tissue thickness.

[0028] The clip 42 includes a pair of inwardly curved arms 202 and 204 interconnected by a bridging section 206, the two arms extending generally parallel in one direction from the bridging section. The arms terminate at tips 210 and 212 which are rounded to prevent injury to the subject tissue. As described above, the bridge portion 206 includes a pair of grooves 208 for engaging the clip applier described above and for feeding the clips down the clip carrier in the applier.

[0029] The size of the clip will naturally vary according to the application, this invention is not limited to a particular size clip.

[0030] Turning now to the actuating mechanism of the instrument and referring to FIGS. 1, 2 and 3, each handle 22 is articulated to the housings 12 and 14, the channel assembly 16, the feed bar 18 and the pusher bar 90 in a similar fashion. More specifically, handles 22

are pivotally connected to opposite sides of the housings 12, 14, by pivot pin 24 and by pins 26 which ride along cam slots 28 of forming cam 30. The forming cam 30 is connected at its distal end to the channel assembly 16, as is discussed in detail below, and at its proximal end to a spring 32. The other end of the spring is attached to the proximal end of the feed bar 18 and biases it in a distal direction. Thus, the spring 32 biases the channel assembly 16 and the forming cam 30 in a proximal direction, such that the handles 22 are biased in an open position. Since each handle is connected in a similar fashion, only the connection of one of the handles will be discussed. As indicated in FIG. 2, the channel assembly 16 is mounted at the distal end of forming cam 30 while the feed bar 18 is attached through spring 32 to the proximal end of forming cam 30. Thus, when handles 22 close together, the pins 26 move along slots 28 of forming cam 30 to distally advance the forming cam 30 which correspondingly advances the channel assembly 16 and overcomes the bias of spring 32. After the channel assembly 16 advances a slight distance distally, e.g. approximately 0.5mm (.020 inch), the nose 84 of the feed bar 18 moves proximally to a position behind the next clip 42 in the clip carrier 40.

[0031] In use, the clip applier 10 is provided with a clip 42 already in the jaws 38 of the jaw blade assembly 17. To apply the clip, the handles 22 are first squeezed together overcoming the bias of spring 32 and causing the channel assembly 16 to move forwardly and the feed bar 18 to move rearwardly into a position to feed the second clip 43 from the clip carrier 40 as described above. As the channel assembly 16 moves forwardly and over jaws 38 of the jaw blade assembly 17, the jaws 38 are cammed closed to form the clip 41 therein. After the nose 84 of the feed bar 18 has moved behind the second clip 43, and the first clip 41 is fully formed in the jaws 36, the clip retainer 51 is biased downwardly by engagement with the nose 84 of feed bar 18. As the handles open and the clip retainer 51 continues to be biased downwardly, the feed cam 18 moves forward and advances the next clip 43 to the jaws 36. The downward biasing of the clip retainer 51 also permits the stack of clips 42, which are normally biased in a forward direction by spring 102, to advance forward and move distally.

[0032] While the preceding paragraphs describe an applier for surgical clips for vascular anastomosis, it should be understood that the applier is not limited to such uses. In fact, applier can also be used for effecting skin closures.

[0033] The claims which follow identify embodiments of the invention additional to those described in detail above.

#### Claims

1. A micro-surgical clip applicator (10) held between the thumb and forefinger of the surgeon during use,

and comprising:

a housing (12, 14)  
 a pair of handles (22) each having a proximal and a distal end and being pivotally connected to said housing at said proximal ends and actuable by squeezing the handles together, at a location distal of the pivotal connections of the handles to the housing, between the thumb and forefinger of the surgeon, in a tweezer-like manner,  
 a pair of jaws (38) extending from said housing for receiving and deforming a clip (42) therebetween;  
 means (40) extending from said housing for holding a series of clips;  
 a channel assembly (16) slidably mounted in said housing;  
 means (30) connected to said channel assembly for sliding said channel assembly in a distal direction in response to closing of said handles to move said jaws towards each other;  
 means (18) slidably mounted in said channel assembly in overlying relation to said clip holding means for feeding said clips into said jaws, said feeding means comprising a feed bar (18) having a nose (84) at a distal end;  
 a pusher bar (90) slidably mounted in said channel assembly for advancing said series of clips along said holding means;  
 first spring means (32) connected between said sliding means and said feeding means for biasing said feeding means in a distal direction and for further biasing said channel assembly in a proximal direction;  
 second spring means (102) biasing said pusher bar in a distal direction to push a foremost clip from said clip holding means to a position between said jaws in response to opening of said handles; and  
 means (51) for preventing movement of said pusher bar.

2. A surgical clip applicator as claimed in claim 1, wherein said jaws and said clip holding means are integral.
3. A surgical clip applicator as claimed in claim 1 or 2, wherein said first spring means biases said handles into an open position.
4. An applicator as claimed in claim 1, 2 or 3, wherein said distal end of said pusher bar has a rounded distal end portion (94) with a pair of prongs (92) for engaging the proximal-most clip on said clip holding means.
5. An applicator as claimed in any one of the preced-

ing claims, wherein said sliding means includes at least one cam slot (28) for engaging with said handles to actuate said channel assembly.

6. An applicator as claimed in any one of the preceding claims, wherein said means for preventing movement is a clip retainer (51) extending from said clip holding means for preventing movement of said clips into said jaws and being movable between a first position which prevents movement of said clips and a second position which permits said clips to advance distally. 5
7. An applicator as claimed in claim 6, wherein said clip retainer is movable from said first position to said second position by engagement with said feeding means. 10
8. An applicator as claimed in claim 7, wherein engagement of said clip retainer with said feeding means causes movement of said clip retainer away from said clip holding means to permit movement of at least one clip positioned on said clip holding means. 15
9. An applicator as claimed in any one of the preceding claims further comprising a spring guide (98) cooperating with said second spring for controlling advancement of said pusher bar. 20

#### Patentansprüche

1. Mikrochirurgische Klemmenbringevorrichtung (10), die zwischen dem Daumen und Zeigefinger des Chirurgen während der Verwendung gehalten wird, und umfassend: 25
- ein Gehäuse (12, 14), 30
- ein Paar von Griffen (22), die beide ein proximales und ein distales Ende besitzen und schwenkbar mit dem Gehäuse an den proximalen Enden verbunden sind und durch das Zusammendrücken der Griffen, an einem Ort distal zu den Schwenkverbindungen der Griffen mit dem Gehäuse zwischen dem Daumen und Zeigefinger des Chirurgen in einer zangenartigen Weise betätigbar sind. 35
- ein Paar von Klemmbacken (38), die sich von dem Gehäuse zur Aufnahme und zum Verformen einer Klemme (42) dazwischen erstrecken; 40
- eine Einrichtung (40), die sich von dem Gehäuse erstreckt, um eine Reihe von Klemmen zu halten; 45

einen Rinnenaufbau (16), der verschiebbar in dem Gehäuse montiert ist;

eine Einrichtung (30), die mit dem Rinnenaufbau verbunden ist, um den Rinnenaufbau in einer distalen Richtung in Antwort auf das Schließen der Griffen zum Bewegen der Klemmbacken aufeinander zu verschieben;

eine Einrichtung (18), die verschiebbar in dem Rinnenaufbau in einer darüberliegenden Beziehung zu der Klemmenhalteeinrichtung montiert ist, um die Klemmen in die Klemmbacken zuzuführen, wobei die Zufuhreinrichtung eine Zufuhrstange (18) mit einer Nase (84) an einem distalen Ende umfaßt;

eine Schieberstange (90), die verschiebbar in dem Rinnenaufbau zum Vorrücken der Reihe von Klemmen entlang der Halteeinrichtung montiert ist;

eine erste Federeinrichtung (32), die zwischen der Verschiebeeinrichtung und der Zufuhreinrichtung verbunden ist, um die Zufuhreinrichtung in einer distalen Richtung vorzuspannen und um weiterhin den Rinnenaufbau in einer proximalen Richtung vorzuspannen;

eine zweite Federeinrichtung (102), welche die Schieberstange in einer distalen Richtung vorspannt, um eine am weitesten vorne gelegene Klemme von der Klemmenhalteeinrichtung in eine Position zwischen den Klemmbacken in Antwort auf das Öffnen der Griffen zu schieben; und

eine Einrichtung (51), um eine Bewegung der Schieberstange zu verhindern.

2. Chirurgische Klemmenanbringevorrichtung nach Anspruch 1, wobei die Klemmbacken und die Klemmenhalteeinrichtung einstückig sind. 45
3. Chirurgische Klemmenanbringevorrichtung gemäß Ansprüchen 1 oder 2, wobei die erste Federeinrichtung die Griffen in eine offene Position vorspannt.
4. Anbringevorrichtung gemäß Ansprüchen 1, 2 oder 3, wobei das distale Ende der Schieberstange einen abgerundeten distalen Endbereich (94) mit einem Paar von Zacken (92) besitzt, um in Eingriff zu treten mit der am weitesten proximalen Klemme auf den Klemmenhalteeinrichtung.
5. Anbringevorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Verschiebeeinrichtung zumindest einen Nockenschlitz (28) aufweist,

um mit den Griffen in Eingriff zu treten, um den Rinnenaufbau zu betätigen.

6. Anbringevorrichtung gemäß einem der vorhergehenden Ansprüche, wobei die Einrichtung zum Verhindern einer Bewegung ein Klemmenhalter (51) ist, der sich von der Klemmenhalteeinrichtung zum Verhindern der Bewegung der Klemmen in die Klemmbacken erstreckt und zwischen einer ersten Position, welche eine Bewegung der Klemmen verhindert, und einer zweiten Position, welche es erlaubt, daß die Klemmen in distaler Richtung vorrücken, bewegbar ist. 5 10
7. Anbringevorrichtung gemäß Anspruch 6, wobei der Klemmenhalter von der ersten Position zu der zweiten Position durch den Eingriff mit der Zufuhreinrichtung bewegbar ist. 15
8. Anbringevorrichtung gemäß Anspruch 7, wobei der Eingriff des Klemmenhalters mit der Zufuhreinrichtung eine Bewegung des Klemmenhalters weg von der Klemmenhalteeinrichtung verursacht, um eine Bewegung mindestens einer auf der Klemmenhalteeinrichtung positionierten Klemme zu gestatten. 20 25
9. Anbringevorrichtung gemäß einem der vorhergehenden Ansprüche, weiterhin umfassend eine Federführung (98), die mit der zweiten Feder zum Kontrollieren des Vorrückens der Schieberstange zusammenwirkt. 30

#### Revendications

1. Applicateur de pinces micro-chirurgicales (10) tenu entre le pouce et l'index du chirurgien pendant l'utilisation et comprenant : 35
  - un logement (12, 14),
  - une paire de poignées (22) ayant chacune une extrémité proximale et une extrémité distale et étant reliée d'une manière pivotante audit logement auxdites extrémités proximales et étant actionnable en resserrant les poignées, à un emplacement éloigné des connexions pivotantes des poignées au logement, entre le pouce et l'index du chirurgien, à la manière d'une pince,
  - une paire de mâchoires (38) s'étendant depuis ledit logement pour recevoir et déformer une pince (42) entre celles-ci ;
  - un moyen (40) s'étendant depuis ledit logement pour tenir une série de pinces ;
  - un ensemble de canal (16) installé d'une manière coulissante dans ledit logement ;
  - un moyen (30) relié audit ensemble de canal pour faire coulisser ledit ensemble de canal dans une direction distale en réponse à la fer-

meture desdites poignées pour déplacer lesdites mâchoires l'une vers l'autre ;

un moyen (18) installé d'une manière coulissante dans ledit ensemble de canal selon une relation de recouvrement audit moyen de retenue de pinces pour amener lesdites pinces dans lesdites mâchoires, ledit moyen d'amenée comprenant une barre d'amenée (18) avec un ergot (84) à une extrémité distale ;

une barre de poussée (90) installée d'une manière coulissante dans ledit ensemble de canal pour faire avancer ladite série de pinces le long dudit moyen de retenue ;

un premier moyen de ressort (32) connecté entre ledit moyen coulissant et ledit moyen d'amenée pour solliciter ledit moyen d'amenée dans une direction distale et pour solliciter en outre ledit ensemble de canal dans une direction proximale ;

un deuxième moyen de ressort (102) sollicitant ladite barre de poussée dans une direction distale pour pousser la pince la plus avant depuis ledit moyen de retenue de pinces dans une position entre lesdites mâchoires en réponse à l'ouverture desdites poignées ; et

un moyen (51) pour empêcher un déplacement de ladite barre de poussée.

2. Applicateur de pinces chirurgicales selon la revendication 1, où lesdites mâchoires et ledit moyen de retenue de pinces sont intégraux.
3. Applicateur de pinces chirurgicales selon la revendication 1 ou 2, où ledit premier moyen de ressort sollicite lesdites poignées dans une position ouverte.
4. Applicateur selon la revendication 1, 2 ou 3, où ladite extrémité distale de ladite barre de poussée a une portion d'extrémité distale arrondie (94) avec une paire de griffes (92) pour venir en prise avec la pince la plus proximale sur ledit moyen de retenue de pinces.
5. Applicateur selon l'une des revendications précédentes, où ledit moyen coulissant comporte au moins une fente de came (28) pour la mise en prise avec lesdites poignées pour actionner ledit ensemble de canal.
6. Applicateur selon l'une des revendications précédentes, où ledit moyen pour empêcher un déplacement est un élément de retenue de pinces (51) s'étendant depuis ledit moyen de retenue de pinces pour empêcher un déplacement desdites pinces dans lesdites mâchoires, et étant déplaçable entre une première position qui empêche un déplacement desdites pinces et une deuxième position qui

permet auxdites pinces d'avancer distalement.

7. Applicateur selon la revendication 6, où ledit élément de retenue de pince est déplaçable de ladite première position à ladite deuxième position par une mise en prise avec ledit moyen d'amenée. 5
8. Applicateur selon la revendication 7, où la mise en prise dudit élément de retenue de pinces avec ledit moyen d'amenée provoque le déplacement dudit élément de retenue de pinces au loin dudit moyen de retenue de pinces pour permettre le déplacement d'au moins une pince positionnée sur ledit moyen de retenue de pinces. 10
9. Applicateur selon l'une des revendications précédentes, comprenant en outre un guidage de ressort (98) coopérant avec ledit deuxième ressort pour contrôler l'avance de ladite barre de poussée. 15

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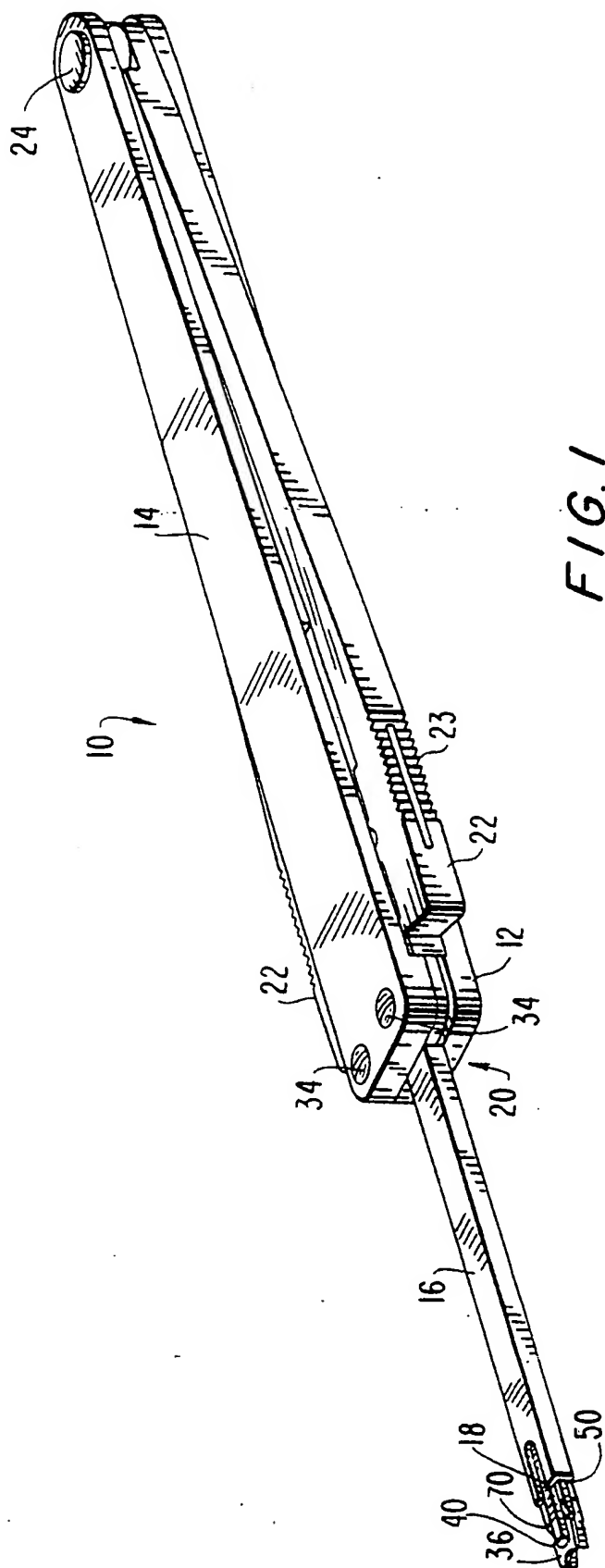
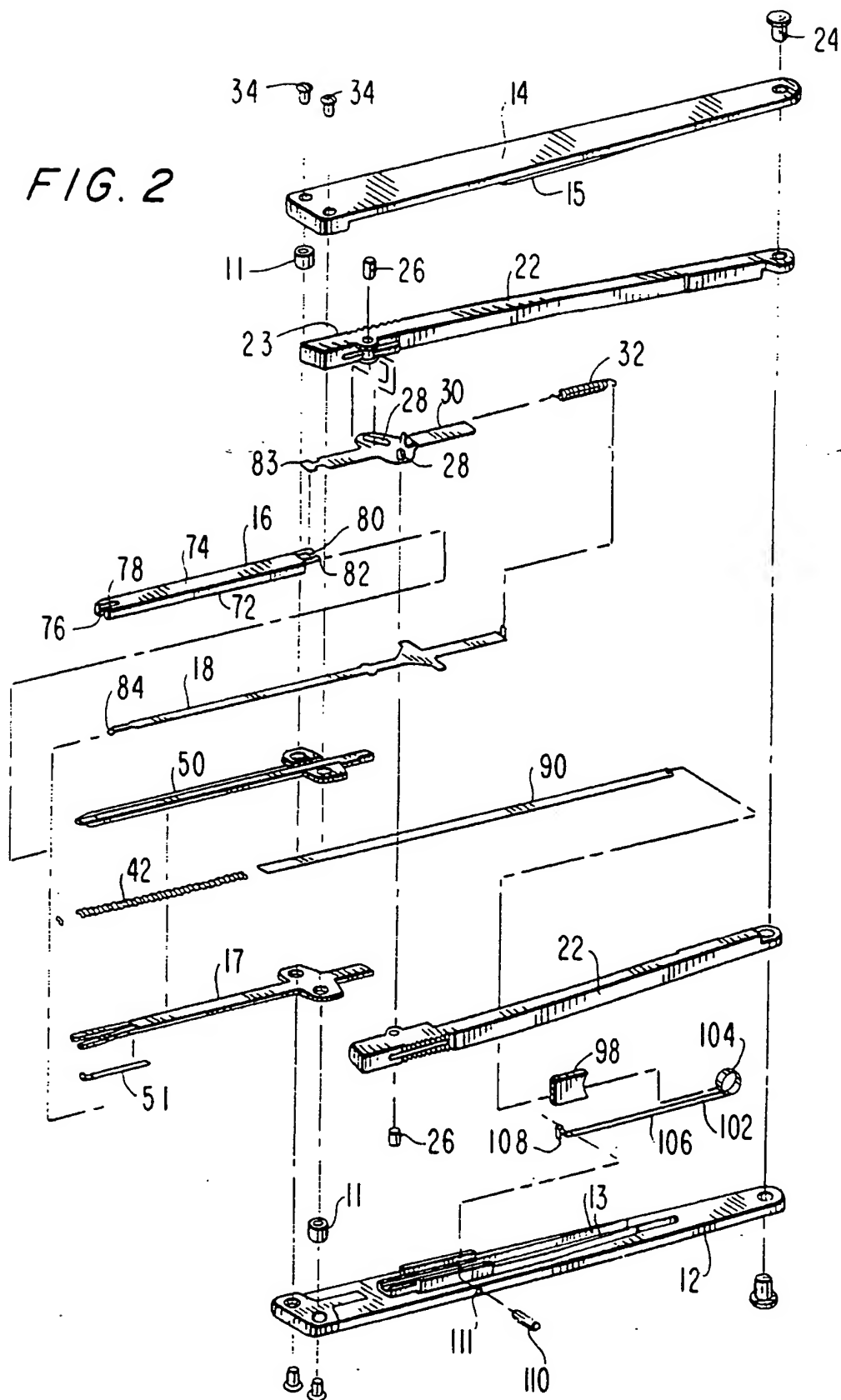


FIG. 1

FIG. 2



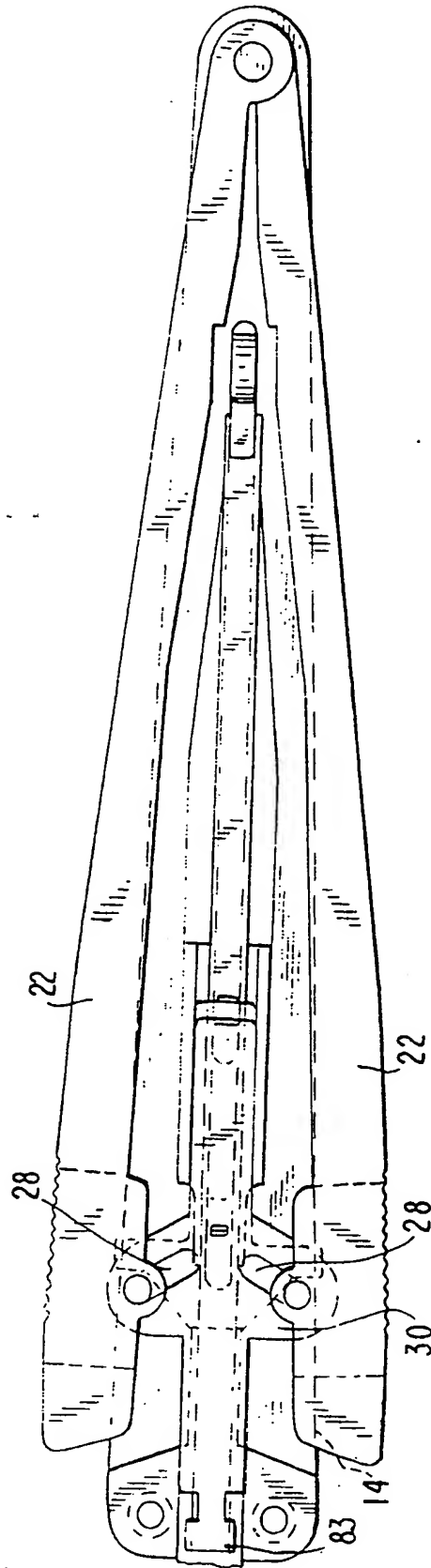


FIG. 3

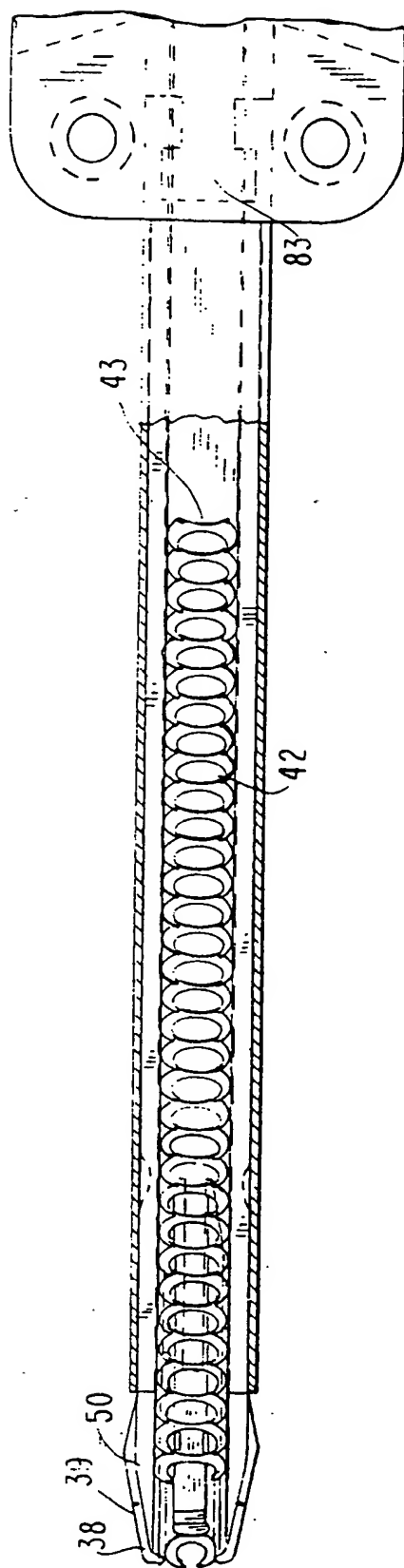


FIG. 4

FIG. 5

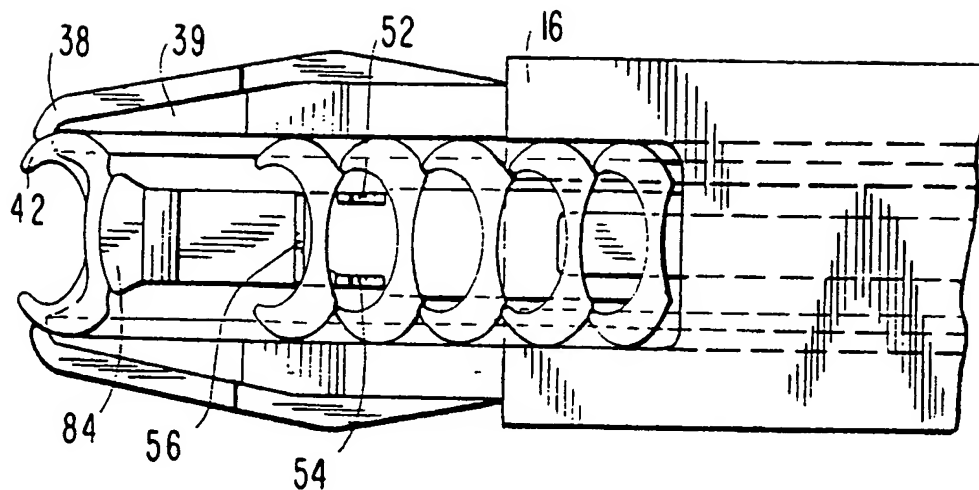
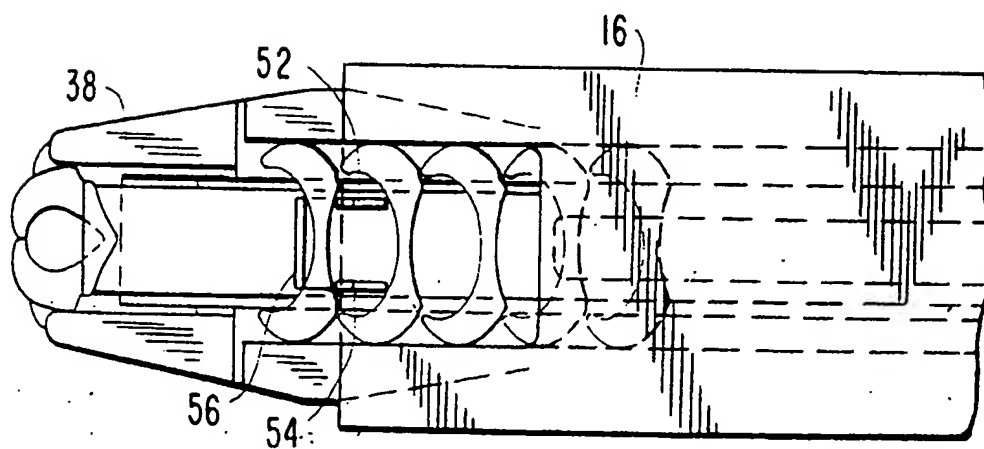


FIG. 6



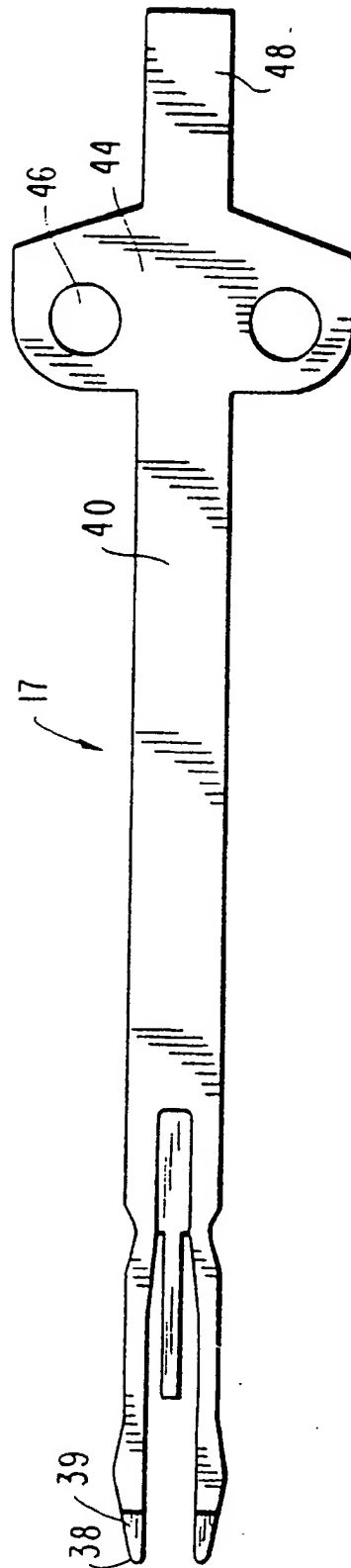
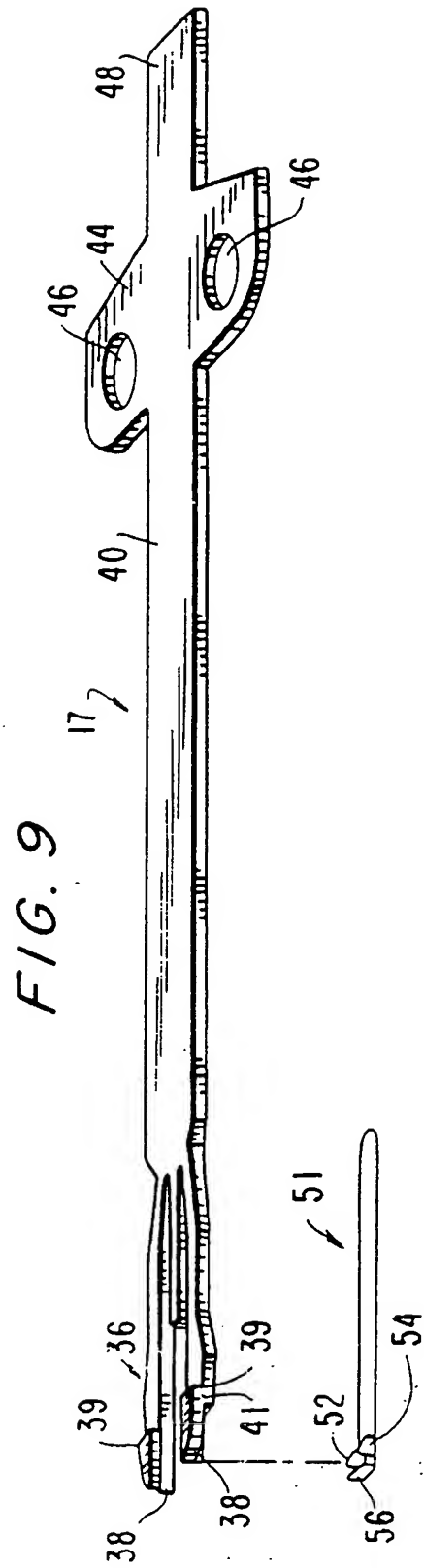
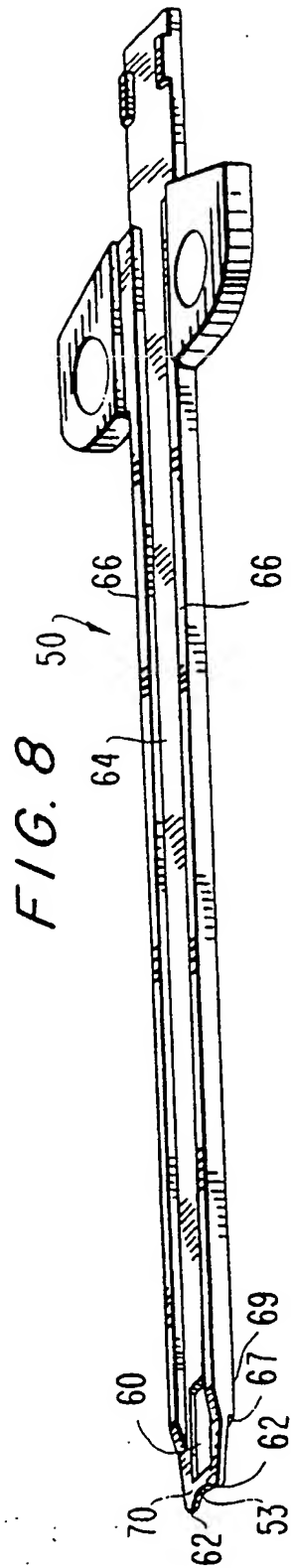


FIG. 7



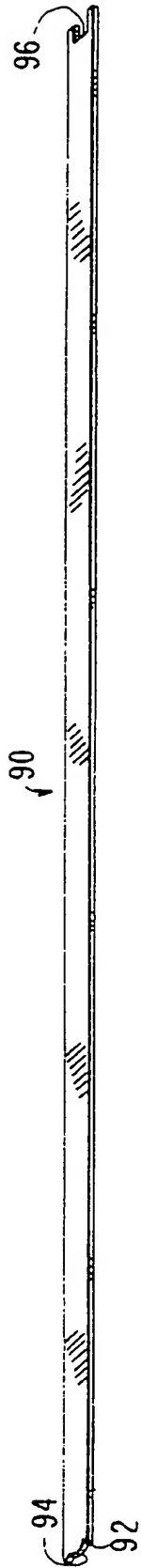


FIG. 10

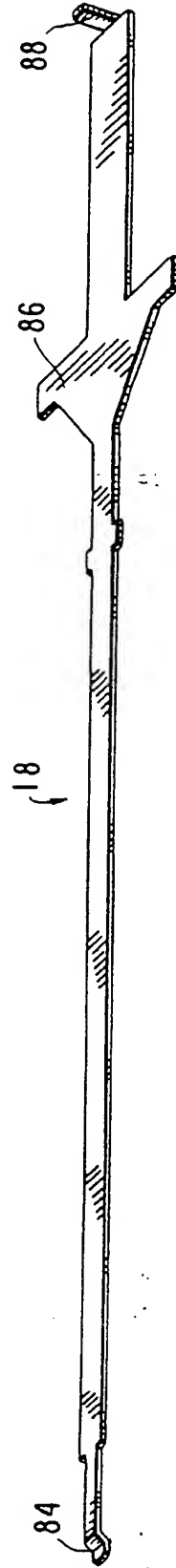


FIG. 11



FIG. 12

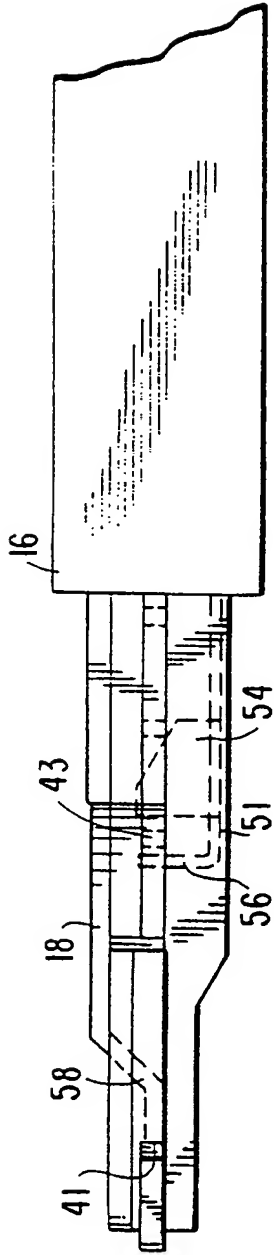


FIG. 13

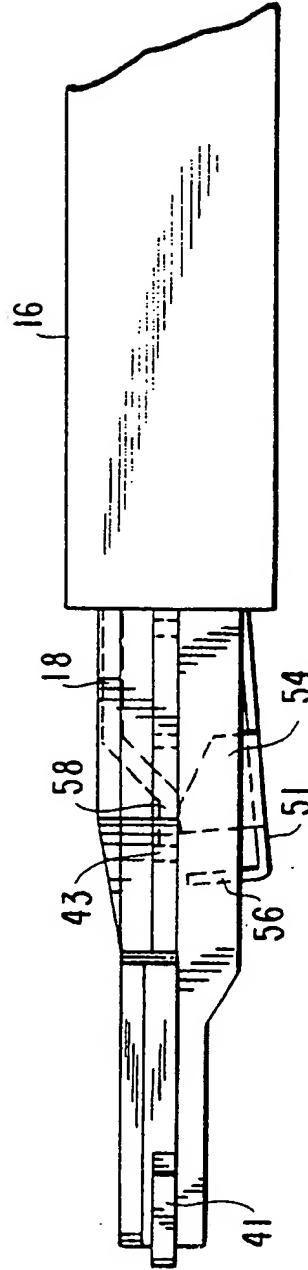


FIG. 14

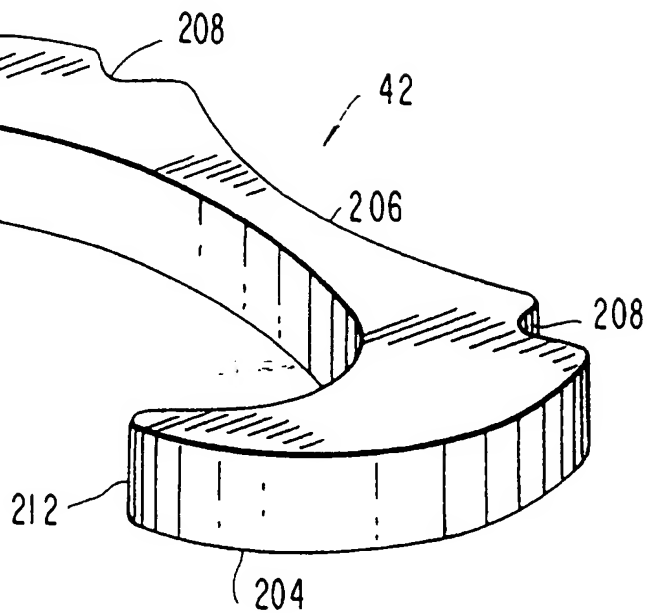


FIG. 15

